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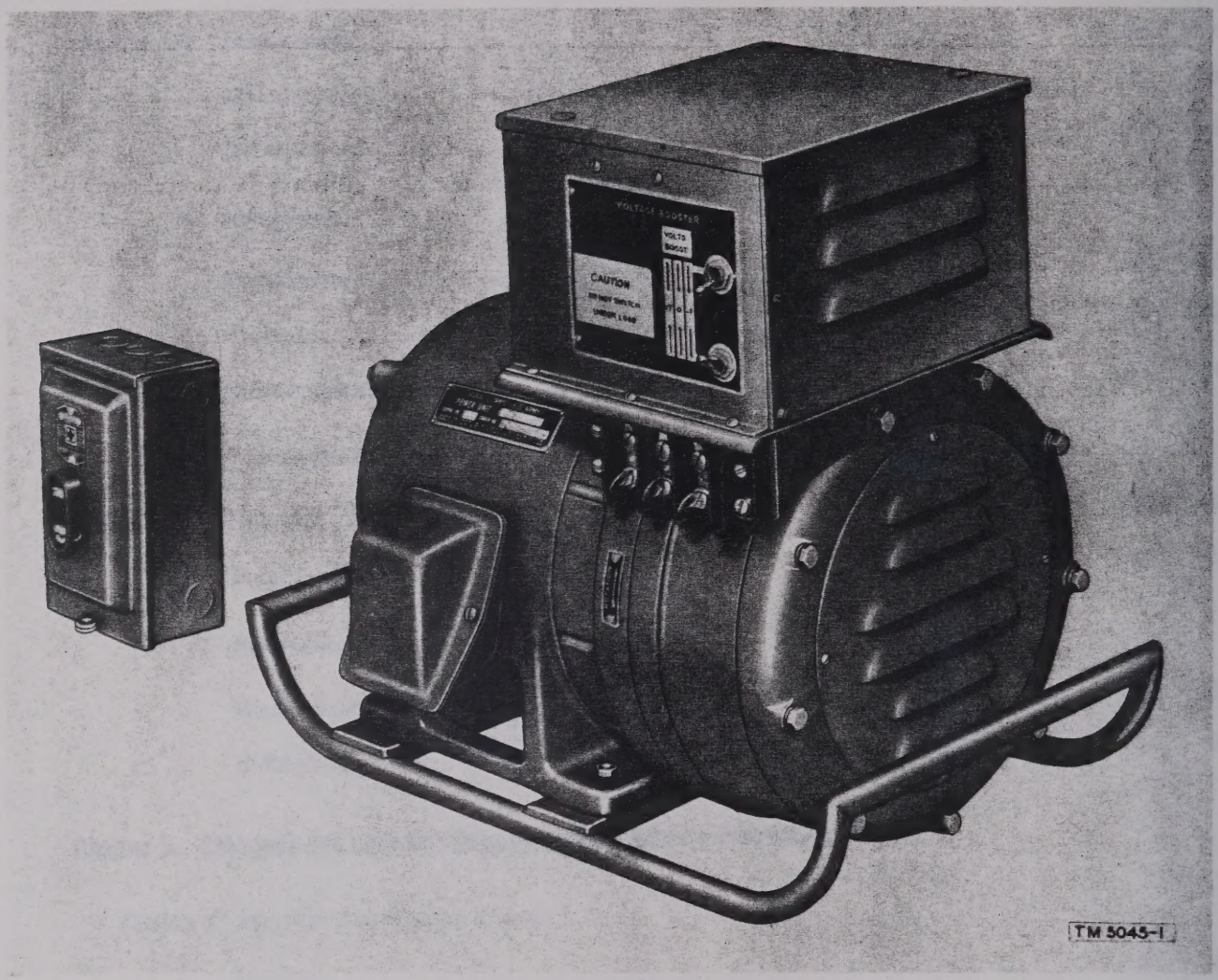

Figure 1. Motor Generator PU-175/U.

CHAPTER 1

INTRODUCTION

Section I. General

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this equipment is issued. They contain information on the operation and on the organizational and field maintenance of the equipment as well as a description of the equipment and a discussion of the theory of operation. These instructions apply only to Motor Generator PU-175/U.

b. Appendix I contains a list of current references applicable to the equipment. Appendix II contains an identification table of parts. Appendix III contains a table of all standard nuts, bolts, screws, and washers used in the equipment that are not special items but are of a type readily obtainable from commercial sources.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army equipment and in performing preventive maintenance.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), NAV DEPT SERIAL 85P00 (Navy), and AFR 71-4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700-45-5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

d. The following forms, explained in TM 37-2810, are necessary in connection with the operation and maintenance of Signal Corps motor generator equipment.

(1) DD Form 110 (Vehicle and Equipment Operational Record).

(2) WD AGO Form 460 (Preventive Maintenance Roster).

(3) DA AGO Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment).

e. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Description of Motor Generator PU-175/U

Motor Generator PU-175/U (fig. 1) is a continuous duty unit designed to supply 2.5-kw (kilowatt), 120-volt, single- or three-phase, 400-cycle ac (alternating current) when operating at 3,428 rpm (revolutions per minute). The driving motor is rated 5 horsepower, three-phase, 220/440 volts, 60 cycles. It is open, ventilated, dripproof, and of ball bearing, squirrel cage construction. The motor and alternator have a common end bell. The alternator rotor is mounted on the motor shaft extension. The alternator is a

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permanent-magnet type and requires no separate excitation. The motor generator is equipped with a voltage booster (fig. 7) which permits raising or lowering the output voltage of the alternator 9 volts in addition to improving the output voltage regulation characteristics. The entire assembly is mounted within a tubular skid frame. The motor starter box (fig. 2) is to be mounted separately from the unit to provide remote control starting.

Note. For the purpose of locating various parts of this equipment, the front will be considered the drive motor end of the unit. The right and left side will be determined by facing the motor end.

4. Purpose and Use

Motor Generator PU-175/U is designed to supply 120-volt, 400-cycle, 2.5-kw ac at .8 power factor for either single- or three-phase output at continuous duty. The equipment may be used wherever 400-cycle ac is required.

5. Major Parts and Assemblies

a. Motor. The drive motor of Motor Generator PU-175/U (fig. 7) is a conventional two-pole, three-phase, squirrel cage induction motor. Nine leads are brought from the stator winding to the junction box (figs. 7 and 11) and provide for 220- or 440-volt connection to the power source. The rotor slots, end rings, and fan are cast in aluminum; this makes a solid integral rotor assembly. When the drive motor is operating from a 220-volt source, the full-load current rating is 14 amperes; from a 440-volt source, the full-load current rating is 7 amperes. The motor is designed for 60-cycle operation, and the synchronous speed is 3,600 rpm. Under full-load operation, the motor has a slip of about 5 percent; this provides approximately the required speed of 3,428 rpm necessary to produce the 400-cycle ac. The motor housing and end bell are cast-iron with the mounting feet cast integral with the housing. The motor is supplied with ball bearings for long life and trouble-free service. The aluminum casting which is used at the shaft extension end of the motor also serves as an adapter casting (fig. 11) to mount the alternator.

b. Alternator. The permanent-magnet type alternator (fig. 7) generates 400-cycle, three-phase ac. The rotor (fig. 11) provides a 14-pole rotating field for the excitation of the stator winding. The stator (fig. 11) of the alternator is wound for three-phase output and is connected star or wye for three-wire, 120-volt output. This alternator is designed for continuous duty and will deliver 2.5 kw at 120 volts with a single or three-phase, .8 power factor load applied.

c. Voltage Booster Unit. The boost-buck type voltage compensator is mounted in a metal box on top of the alternator (fig. 7). It consists of a three-phase step-up transformer (figs. 8 and 10) with its primary windings connected in series with the alternator winding, while each of its secondary windings is connected to a 1,000-volt, 2 uf (microfarad) capacitor. Two switches (figs. 7 and 10) are mounted in the compensator unit box either to raise or lower the output 9 volts, respectively (par. 16b).

d. Frame. The components of Motor Generator PU-175/U are mounted on a skid type welded tubular frame (fig. 7).

e. Motor Starter. The separate starter box (fig. 2) supplied with Motor Generator PU-175/U is a three-phase, manually operated, line voltage starter. The starter box is provided with two push buttons: one for starting and one for stopping the motor. Two thermal protectors (fig. 2) are supplied with the starter box to break the circuit in the event of an overload on the motor. When the thermal protectors open the circuit, they can be reset, after cooling, by first pushing the STOP RESET button and then the START button. The motor starter box normally is equipped with thermal protectors for 220-volt operation only. For 440-volt operation, separate thermal protectors are supplied (par. 8b) and must be installed in the starter box in place of the thermal protectors used for 220-volt operation.

6. Performance Characteristics

The following performance data are those of a typical Motor Generator PU-175/U. However, some slight deviations from these data may be noticed, depending on the input voltage and frequency to the drive motor.

6. Performance Characteristics (contd)

Approximate load	No. of phases	VOLTS BOOST position	Amp per phase	Average phase to phase volts	Kw	Approximate cycles per second	Power factor
None		Neutral	0	130.7	0	417.0	
None		Buck	0	121.7	0	417.0	
None		Boost	0	140.5	0	417.0	
Full	3	Neutral	11.6	125.0	2.5	403.0	1.0
Full	3	Neutral	14.2	127.3	2.5	402.7	.8
Full	3	Buck	12.4	116.2	2.5	402.4	1.0
Full	3	Buck	15.0	120.2	2.5	402.9	.8
Full	3	Boost	10.8	134.2	2.5	403.2	1.0
Full	3	Boost	13.3	136.6	2.5	402.8	.8
Full	1	Neutral	20.5	121.6	2.5	402.5	1.0
Full	1	Neutral	24.2	129.0	2.5	401.9	.8
Full	1	Buck	22.1	112.3	2.5	402.7	1.0
Full	1	Buck	25.4	123.0	2.5	401.5	.8
Full	1	Boost	19.1	130.6	2.5	402.2	1.0
Full	1	Boost	22.6	138.8	2.5	401.8	.8

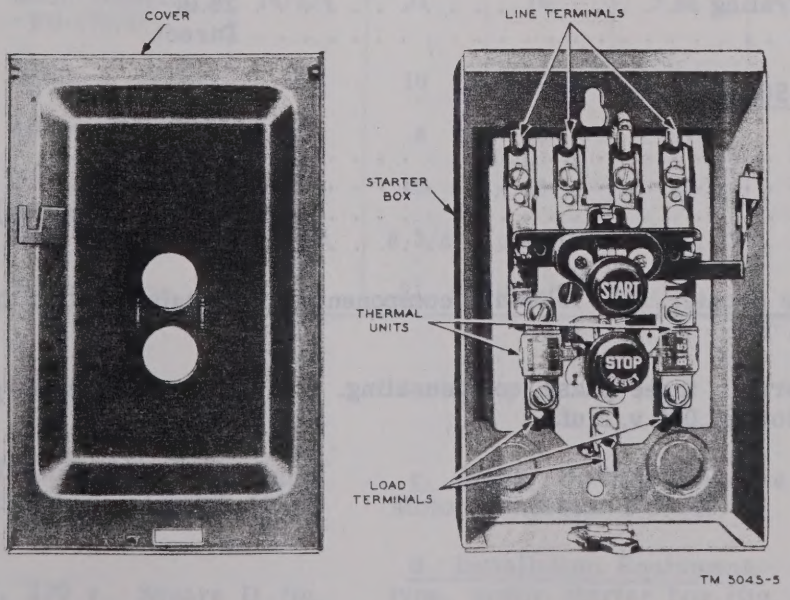

Figure 2. Motor starter, Motor Generator PU-175/U, cover open.

7. Table of Specifications

a. Motor.

Make	Crocker-Wheeler Electric Mfg. Co.
Model	BA225.
Type	Squirrel cage induction.
Horsepower	5.
Voltage	220/440.
Phase	3.
Cycle	60.
Speed	3,428 rpm (full-load).
Ampere rating	14/7.
Cooling	Forced air.
Bearings	Ball bearing.
Frame	Open dripproof.
Temperature rise	40° C (centigrade).

b. Alternator.

Make	Motoresearch Company.
Model	90.
Type	Permanent-magnet.
Cooling	Forced air.
Rating	2.5 kw/3.1 kva (kilovolt-ampere)
Voltage	120.
Phase	3.
Cycle	400.
Speed	3,428 (rpm).
Power factor	.8.
Ampere rating	26.0.
Drive	Direct.

c. Motor Starter.

Make	Square D Co.
Class	2,510.
Type	W-10 (push button).
Rating	5 hp -220 v.

d. Voltage Booster. The following components are contained within the voltage booster cabinet (fig. 10):

1 transformer, three-phase, compensating.
3 capacitors, 1,000 v, 2 uf.
2 switches, three-pole, two-position.

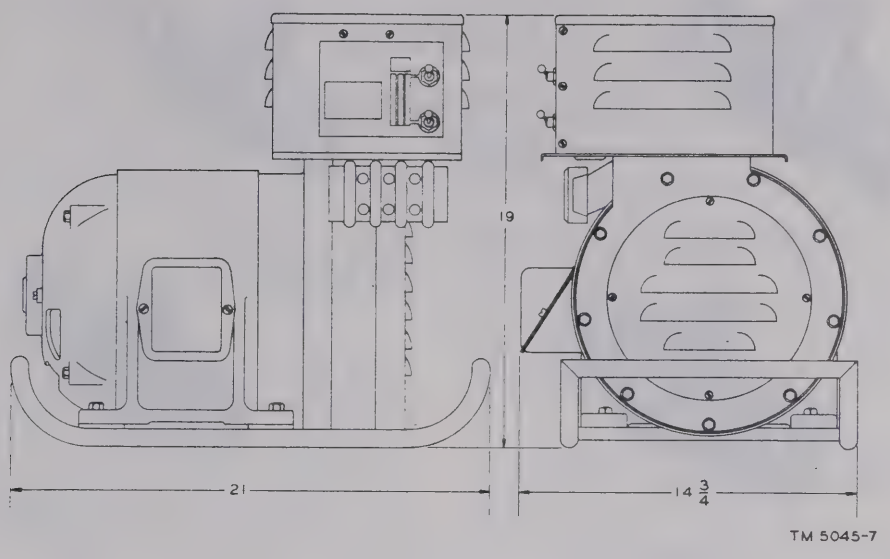

Figure 3. Motor Generator PU-175/U, outline dimensions.

8. Tabular Data

a. Weights and Dimensions.

Quantity	Item	Dimensions				Weight (lb)
		Width (in.)	Length (in.)	Height (in.)	Volume (cu ft)	
1	Motor Generator PU-175/U	14-3/4	21	19	3.46	186
1	Motor	14	10	12	.97	92
1	Alternator	12	8	12	.67	64
1	Voltage booster	8	10	6	.28	17
1	Motor starter	5-1/4	8-3/8	4-7/16	.11	6
1	Tubular frame	13	21	4-1/2	.71	7

b. Spare Parts. The following spare parts are supplied with Motor Generator PU-175/U (fig. 4):

2 thermal units, 220 v., Square D No. B15.5.
4 thermal units, 440 v., Square D No. B7.7.

c. Tools. No hand tools are furnished with Motor Generator PU-175/U.

d. Installation Equipment. A push-button type, motor starter box (fig. 2) is supplied with the motor generator for installation separate from the unit.

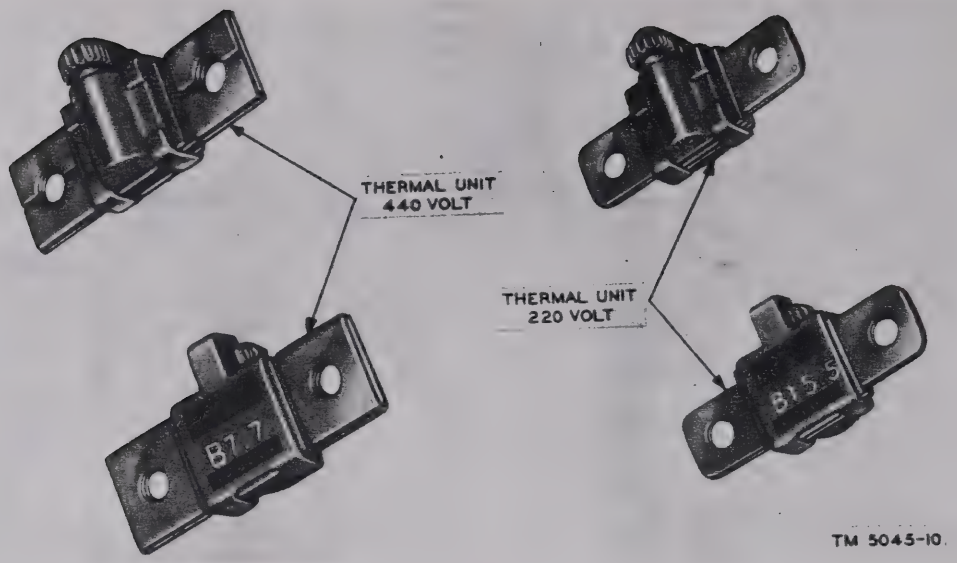

Figure 4. Running spares, Motor Generator PU-175/U.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Siting

Locate Motor Generator PU-175/U as near as possible to the external electrical load to prevent excessive voltage drop in the lines. For the same reason, locate the unit as close as possible to the power source for the drive motor. If possible, the site for the unit should be level and indoors or well protected from the elements. Locate the unit to allow free movement of air on all sides. A clearance of 3 feet around and above the unit is recommended. Do not permit any obstruction to hinder air circulation.

10. Preparation of Foundation

No special foundation is required; however, place the motor generator on a firm, level surface which is capable of supporting the weight (186 pounds) of the unit. If, in an emergency, the unit cannot be placed in a level position, be sure that the alternator end is the lower end. When placed on a smooth, hard surface, vibration may cause the unit to creep or walk. To overcome such a condition, cushion the unit on the foundation, or bolt the skid frame to the supporting surface. The base of the packing crate also will serve as a satisfactory foundation.

11. Uncrating, Unpacking, and Checking

a. Uncrating and Unpacking. When packed for oversea shipment, Motor Generator PU-175/U (fig. 1) is protected by a waterproof cover and a moisture-vaporproof barrier within the crate. Do not open the crate until the unit is needed. Avoid damage to the waterproof cover and the moisture-vaporproof barrier before installation of the unit. (The waterproof cover and moisture-vaporproof barrier are not used when the unit is packaged for domestic shipment.) Proceed as follows to unpack the motor generator:

(1) Be sure the unit is right side up.

(2) Cut and remove the metal straps from the crate.

(3) Remove the nails holding the cover, sides, and ends of the crate to the base.

(4) Open the waterproof cover and unpack the instruction book which is packed on top of the moisture-vaporproof barrier. The packaging within the crate is secured under the motor generator and cannot be removed completely until the following operations (subpars. (5) through (8) below) are finished.

(5) Open the sealed moisture-vaporproof barrier.

(6) Open the inner corrugated paper wrapping which incloses the unit.

(7) Unfasten the bolts which secure the motor generator to the crate skid base.

(8) Lift the unit from the crate skid base.

Note. In so far as possible, preserve all packaging materials for future use.

b. Checking. Appendix II of this manual contains an identification table of parts for Motor Generator PU-175/U. Be sure that all parts of the equipment, including accessories and spare parts, are in accordance with the packing list and in good condition. If any damage is noted or the equipment does not check with the packing lists, fill out and forward DD Form 6 in accordance with the directions prescribed in paragraph 2a.

12. Setting Up Equipment

After a suitable site has been chosen (par. 9) and a foundation prepared (par. 10), set up the motor generator for operation. Install

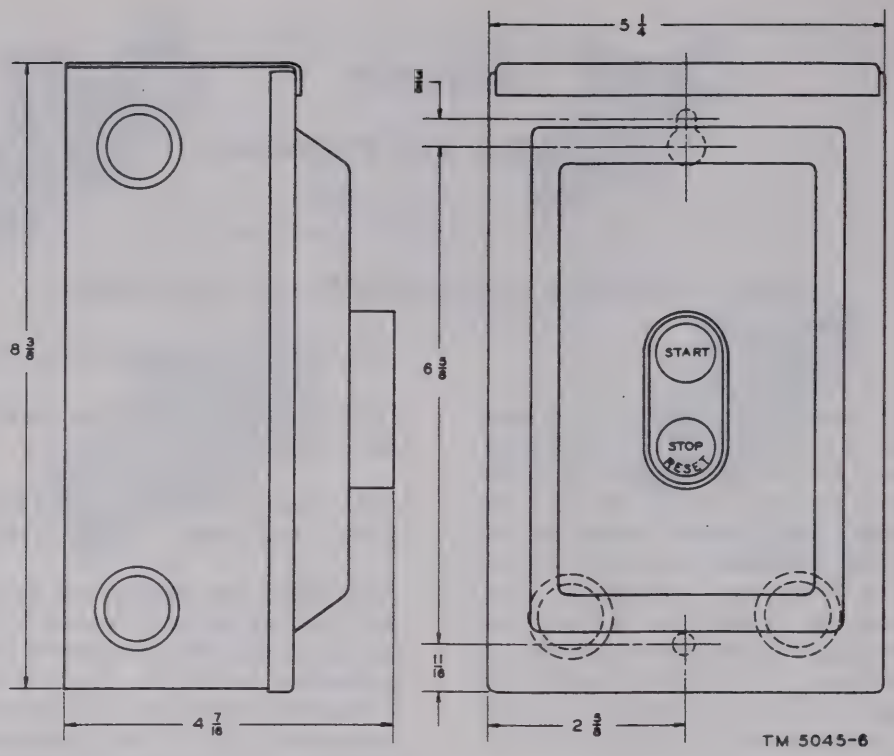

Figure 5. Motor starter, Motor Genetator PU-175/U, outline and mounting dimensions.

the motor starter (figs. 2 and 5) in a suitable location and make connections (par. 14) to the power source and to the drive motor. Be sure that the equipment is clear of all obstructions and is in position to allow free air circulation for ventilation (par. 9). Check and tighten all bolts and connections.

13. Removal of Corrosion Preventives

No special preservatives are used on the equipment. Moving parts that are affected by corrosion have been treated with oil which will not interfere with the operation of the motor generator.

14. Connections and Interconnections

Caution: Be sure that the power supply lines are open circuit and not alive before starting to make connections. After the motor generator has been set up as described in paragraph 12, make the electrical connections for the equipment. Figures 2, 6, and 7 show connection points for the motor starter and for the alternator output.

a. Connect the power supply line to the line terminals (top) in the motor starter (fig. 2).

b. Follow the nameplate instructions on the drive motor (fig. 8) and make the proper motor connections at the motor junction box for 220 or 440 volts according to the voltage and frequency of the power source. For 220 volts, connect motor terminals 4-5-6 together and tape the connection. Then connect motor terminals 7-1, 8-2, and 9-3, respectively, to the three load terminals (bottom) in the motor starter (fig. 2). For 440 volts, connect motor terminals 4-7, 5-8, and 6-9, respectively, in pairs and separately tape the three connections. Then connect motor terminals 1, 2, and 3 respectively, to the three load terminals (bottom) in the motor starter (fig. 2).

c. After the motor connections have been made and checked, set the VOLTAGE BOOSTER switches (fig. 7) in the VOLTS BOOST zero position and run the unit without an external load. Check the rotation of the alternator with the ROTATION plate arrow on the alternator housing (fig. 7) by removing the louver cover and observing the direction of rotation which may be seen

at the instant of start. If the unit is rotating in the wrong direction, reverse any two of the three drive motor load terminals at the bottom of the motor starter (fig. 2). The unit will generate voltage for either direction of rotation, but the direction must be correct to provide proper air circulation for cooling.

Caution: Do not attempt to change any electrical connections while the motor generator is operating. Stop the unit before making load connections at the output terminals.

d. Connect the load to the output terminals (fig. 7) located on the right side of the motor generator just below the voltage booster. Use No. 10 or larger wire to prevent voltage drop in the lines. Loosen the wing bolts, attach the load wires, and tighten the wing bolts.

15. Initial Lubrication

No initial lubrication is necessary before operation of Motor Generator PU-175/U. The unit is equipped with two ball bearings which are factory lubricated. Further lubrication is necessary only at the time of disassembly for technical inspection or overhaul (par. 43 and fig. 11).

Note. For used or reconditioned equipment, follow the instructions contained in paragraphs 9 through 15.

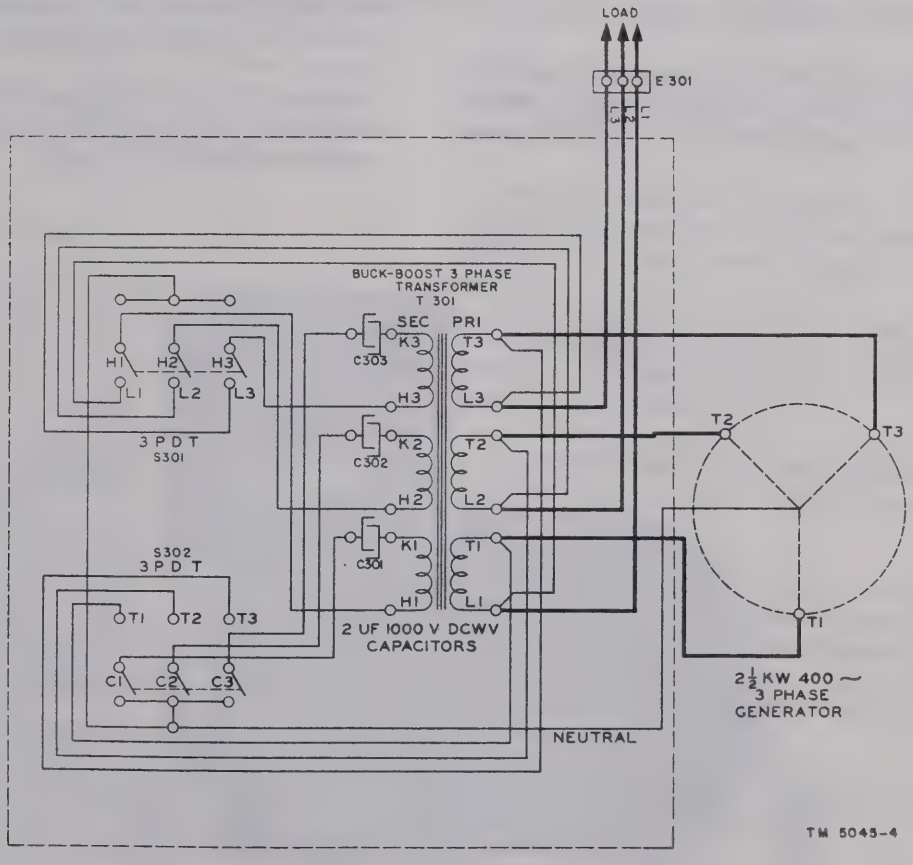

Figure 6. Wiring diagram, generator control.

Section II. CONTROLS AND INSTRUMENTS

Note. This section describes, locates, illustrates, and furnishes the operating personnel with information pertaining to the various controls and instruments provided for the proper operation of the equipment.

16. Controls

a. Motor Starter. A push-button type motor starter (fig. 2) is furnished with Motor Generator PU-175/U for remote control of the drive motor. The across-the-line type starter is rated 5 horsepower at 220 volts for three-phase service. Push the START button to operate the motor generator and push the STOP RESET button to stop the unit. The motor starter is equipped also with thermal units for automatic overload protection (par. 17).

Note. Be sure that the proper thermal units (par. 17) are installed in the motor starter before pushing the START button.

b. Voltage Booster. The alternator output voltage is controlled by a voltage booster (fig. 7) by which the voltage may be increased or decreased approximately 9 volts. The primary windings of a compensating transformer are connected in series with the alternator windings. The secondary windings are connected to capacitors to provide voltage compensation under load, and, in addition, to provide a buck-boost action. Two switches are mounted in the voltage booster (fig. 7). When both switches are up, the output voltage is boosted 9 volts. When both switches are down, the output voltage is bucked 9 volts. When the top switch is down and the lower switch is up, the voltage booster is in the zero position and will aid automatically in improving the output voltage regulation at the lower power factor loads. A VOLTS BOOST diagram indicating the switch positions is mounted on the right side of the voltage booster (fig. 7).

Caution: Do not operate the VOLTAGE BOOSTER switches when the alternator is carrying an external load.

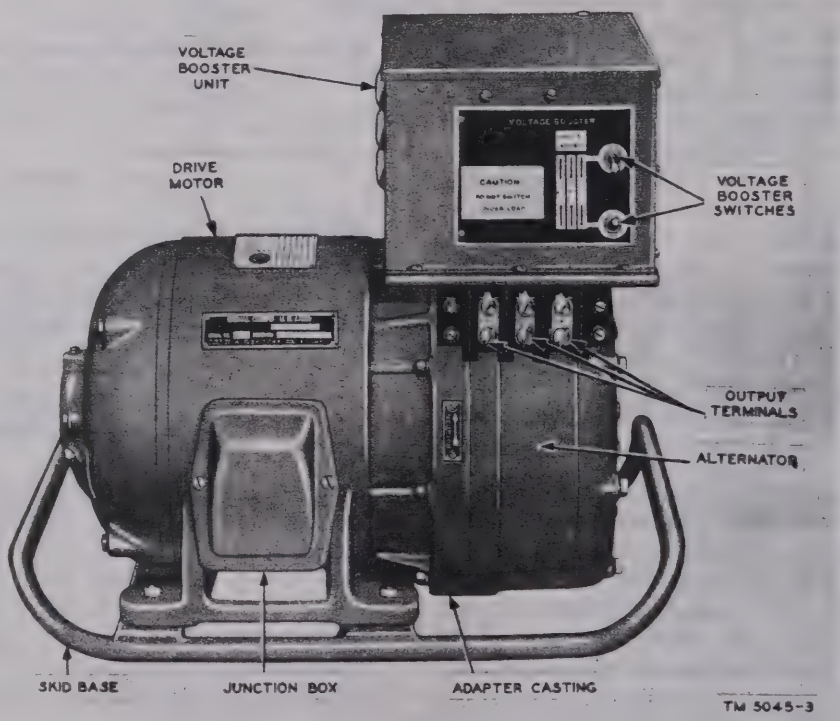

Figure 7. Motor Generator PU-175/U, right side.

17. Automatic Controls

Motor Generator PU-175/U is furnished with a motor starter (fig. 2) which is equipped with thermal units to protect the equipment in case of overheating due to overload on the alternator. Two thermal units (fig. 2) are located in the motor starter. Excessive heat, resulting from overload, will release the spring tension on the starter, automatically break the circuit, and stop the drive motor. After the thermal units have functioned thus, correct the overload condition before restarting the unit. To restart the unit, first push the STOP RESET button and then push the START button. Separate thermal units are furnished for 220- or 440-volt power supply, respectively. Install two thermal units B15.5 for 220 volts operation or two thermal units B7.7 for 440-volt operation (fig. 4). The motor starter is used also as a manually operated control (par. 16a).

18. Instruments

No instruments, meters, or gages are supplied with Motor Generator PU-175/U. External meters will be necessary in making electrical checks on the equipment.

Section III. OPERATION UNDER USUAL CONDITIONS

Note. Personnel charged with the operation of the equipment covered in this manual will secure DD Form 110 (Vehicle and Equipment Operational Record) and make appropriate entries thereon.

19. Preliminary Procedure

Before starting the unit the first time or after a prolonged period of shut-down, check the following:

a. Remove the alternator louver cover (figs. 1 and 11) and turn the rotor manually to see that it rotates freely.

b. Remove any obstructions which may prevent free air circulation around the unit (par. 9).

c. See that the Motor Generator is clean and free of dust and dirt.

d. Check the size of wire from the power source to the motor starter, from the motor starter to the drive motor, and from the alternator to the external load. Be sure that the wire is #10 or larger to prevent voltage drop.

e. See that all electrical connections are secure and make good contact.

f. Check all fastenings to see that they are secure.

g. See that the thermal unit protectors in the motor starter (par. 17) are correct for the voltage of the power source.

h. Be sure that the connections within the drive motor junction box are correct for the voltage of the power source (par. 14b).

i. Be sure that the unit is mounted on a flat level surface, if possible. If impossible, be sure to adhere to the directions prescribed in paragraph 10.

j. Place the VOLTAGE BOOSTER switches (fig. 7) in zero position before starting the equipment.

k. After prolonged periods of shut-down, the windings may absorb moisture. As a precaution, operate the equipment without load for a sufficient period of time to allow the normal heating of the unit to dry the windings.

l. See that all protective covers are in place before starting the unit.

m. Check the unit for proper rotation (par. 14c).

Caution: Do not operate the VOLTAGE BOOSTER switches under load. Stop the unit or remove the load from the alternator before changing the switches to raise or lower the output voltage.

20. Starting

To start the motor generator, push the START button on the motor starter (fig. 2). After about 3 seconds, a steady audible hum will indicate that the unit has reached operating speed. Allow the unit to run for approximately 5 minutes before applying load to the alternator.

21. Precautions after Starting

Observe the unit for any unusual noises or operating characteristics. Do not remove protective covers from the unit while it is in operation. See that the motor generator is operating in the right direction of rotation as explained in paragraph 14c. Observe the temperature of the unit; it should be possible to place the bare hand on the motor or alternator frame at all times.

22. Applying External Load

Allow the motor generator to run approximately 5 minutes before applying the load. Connect the external load to the output terminals (fig. 7). Provide a switch in the alternator load circuit to allow the load to be applied after starting the unit. Check the performance of the unit with the VOLTAGE BOOSTER switches in zero position. If the voltage output is too high or too low, adjust the condition by means of the boost-buck switches (fig. 7), but be sure either to remove the external load or to stop the unit before making the adjustment. Check the load current and be sure that it is within the range of the alternator rating as shown on the nameplate. If the thermal unit protectors function and stop the unit, the motor generator is overloaded or electrical connections are wrong. Find and correct the trouble. Then proceed to start the unit by first pushing the STOP RESET button and then the START button.

23. Operating Procedure

Be alert for unusual noises or indication of excessive heating. Investigate any abnormal condition and make corrections as soon as possible. When trouble is indicated, stop the motor generator and investigate. Check the load at intervals to see that it is within the rating of the alternator as indicated by the nameplate. The maximum load current rating at 120 volts is 26.0 amperes. If the output voltage is high or low, use the voltage booster (par. 5c and fig. 7) to compensate the difference. Do not operate the VOLTAGE BOOSTER switches while an external load is applied.

24. Stopping

Before stopping the unit, turn off the switch in the load circuit (par. 22); then push the motor starter STOP RESET button (fig. 2). Set the VOLTAGE BOOSTER switches to zero position (fig. 7).

Warning: Do not open the voltage booster cabinet and do not touch electrical connections when the motor generator is running.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

25. Operation in Arctic Climates

Special precautions necessary for operation of the equipment in extremely low temperatures are explained fully in TB SIG 66. Motor Generator PU-175/U is designed to operate at a minimum temperature of -40° F. The equipment is intended for operation within a shelter; therefore, take precautions to protect the unit from the elements when necessary.

26. Operation in Desert Climates

Special precautions necessary to operate the equipment in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained fully in TB SIG 75. Motor Generator PU-175/U is designed to operate at a maximum temperature of +132° F. Keep the unit clean and protect it from sand and dust as much as possible.

27. Operation in Tropical Climates

A special moisture-proofing and fungi-proofing treatment process has been established and will provide a reasonable degree of protection for the motor generator under tropical conditions. This treatment is explained in TB SIG 13. Also see TB SIG 72. Shield the unit from the direct rays of the sun and protect the equipment according to prevailing conditions.

28. Operation in High Altitudes

Motor Generator PU-175/U is designed to operate at altitudes from sea level to 10,000 feet above sea level. Keep the unit free from obstructions that would prevent the free circulation of air. Otherwise, no special precautions are necessary.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

29. Catalog Reference

All parts and equipment supplied with Motor Generator PU-175/U are listed in paragraph 8 of this manual. See the Department of the Army Supply Catalog SIG 7 & 8-PU-175/U.

30. Use and Care of Tools

The proper use of tools is very important as improper use will damage the tools or damage the equipment, and may result in personal injury.

a. Use of Tools. (1) Wrenches. When tightening a nut, bolt, or cap screw, be sure to use the proper wrench for the job. Do not use a wrench that is slightly oversize or one that is badly worn, as this will result in rounding the nut, bolt head, or screw head, and may cause damage to the equipment or personal injury if the wrench should slip. Never use pliers for tightening or loosening nuts, bolts, or cap screws. If possible, always use the correct size open-end wrench, box wrench, or socket wrench. If these are not available, use an adjustable wrench. When tightening cap screws, use a torsion wrench, if one is available. Never use a pipe or other means to increase the leverage as this will bend or break the wrench and may possibly strip the threads.

(2) Screw drivers. When loosening or tightening a fastening having a slotted head, use a screw driver with a blade that fits the slot in the head of the fastening. Do not use a wrench or pliers on the shank of the screw driver to increase leverage. Be sure to keep the blade of the screw driver square in the slot of the fastening. Never use a screw driver as a pry bar or chisel.

(3) Other tools. Specific tools are made for specific purposes. Make sure to use the right tool for the job; and be certain that it is of the correct size for the work to be done.

b. Care of Tools. The condition in which a mechanic keeps his tool equipment is a good indication of his ability. Do not abuse tools by using them for work for which they were never intended. Keep tool equipment properly stowed and protected from dirt and dampness at all times. After a tool has been used, clean it thoroughly and replace it in its proper place in the toolbox. Keep all tools free from rust and keep adjustable tools, such as pliers and adjustable wrenches, lubricated. Keep the toolbox clean and free from all foreign matter and debris. After cleaning tools and before putting them away, wipe them with a clean cloth moistened with oil to protect them against rust. For more complete details on the care and use of tools, refer to TB 11-453-1. This technical bulletin deals with the use of various wrenches and other tool equipment.

Section II. LUBRICATION AND PRESERVATION

31. Lubricants

Lubricant symbol	Standard nomenclature	Specification No.	Application
WB	Grease, general purpose No. 2.	U.S. Army 2-108B.	Drive motor, ball bearings.

32. Lubricating Periods

The ball bearings are the only portion of the equipment which require periodic lubrication. Lubricate them annually or after every 2,048 hours of operation, whichever is first, as determined from the log.

33. Factory Lubricated Parts

Motor Generator PU-175/U is equipped with two ball bearings which have been factory lubricated. Further lubrication is unnecessary until disassembly for technical inspection, general overhaul or as prescribed in paragraph 32. General disassembly is to be performed annually.

34. Lubrication Requiring Disassembly

To lubricate the ball bearing at the alternator end of Motor Generator PU-175/U, it is necessary to disassemble the unit partially (fig. 11). Proceed as follows:

a. Remove the motor generator from the skid base by removing the four mounting bolts.

b. Remove the alternator end bell at the rear of the unit.

c. Remove the stator assembly from the drive motor adapter casting. It is not necessary to disassemble the voltage booster from the stator assembly.

d. Remove the grease plug from the bearing housing in the drive motor adapter casting and attach a zerk-type grease fitting.

e. Remove the grease plug from the bearing housing at the front end of the drive motor and attach a zerk-type fitting.

f. Grease the bearings by using the lubricant specified in paragraph 31.

g. Remove the zerk-type fittings and replace the grease plugs.

35. Routine Lubrication

No routine lubrication, other than that described in paragraph 32, is required. Take necessary precautions to keep dust and dirt away from rotating parts.

36. Weatherproofing

Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials. When operating the equipment under severe climatic conditions, follow instructions in paragraphs 25 through 27.

37. Rustproofing

To prevent rust formation on the equipment, keep all exposed surfaces in good condition. If the finish of the equipment has been damaged, refinish it as instructed in paragraph 38. Keep the equipment dry and protect it from moisture at all times. If the equipment is to be out of service for a considerable period of time, or if it is to be placed in storage, prepare it as instructed in paragraph 67.

38. Painting and Refinishing

a. If the painted surfaces of the equipment have become scratched or the finish has become otherwise damaged, rust and corrosion may be prevented by thoroughly cleaning and by touching up the damaged surfaces with paint.

b. If only small portions of the surface have been damaged, remove all oil, grease, and dirt with Solvent, dry-cleaning (SD) and thoroughly sandpaper the spots to be painted. Apply the paint in light, even coats. Two light coats are more effective than one heavy coat.

c. If the painted surfaces are scraped or chipped badly, or the paint has become blistered, remove all of the old finish with paint remover. Clean all surfaces thoroughly with sandpaper and apply a smooth, even priming coat. Sandpaper the priming coat lightly with fine sandpaper and then apply two light, smooth coats of finish paint.

d. When refinishing the unit or parts of the equipment, avoid getting paint on electrical contact surfaces; keep the paint away from all moving parts if their movement might be hindered by painting.

Section III. PREVENTIVE MAINTENANCE

39. Definition of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed periodically on equipment in order to obtain top efficiency in performance, to reduce unwanted interruptions in service, and to eliminate major break-downs. To understand preventive maintenance, it is necessary to distinguish between it and trouble shooting and repair. The primary function of preventive maintenance is to prevent major break-downs and consequent necessity of repair. In sharp contrast, the primary function of trouble shooting and repair is to locate and correct existing defects. The importance of preventive maintenance cannot be overemphasized. Power equipment is one component of a complete system, and each component of an over-all system must be ready when needed and able to operate at peak efficiency. Operators and repairmen must maintain all power supply equipment properly. The most important preventive maintenance operation is a thorough and systematic inspection of the equipment at regular intervals. Through these inspections, personnel charged with the care of the equipment should be able to detect abnormal conditions and possible sources of trouble and to correct them before major troubles or break-downs occur.

40. Daily Maintenance Service

For the purpose of these instructions, a daily service period is considered to be 8 operating hours. Services are to be performed in accordance with DD Form 110 in the specified sequence. Keep an accurate record of the operating hours for the unit on the reverse side of the form.

a. Before Operation. See that the motor starter (fig. 2) is connected properly to the power source and to the drive motor (par. 14). Check all electrical connections and see that they are secure. The load must not be connected to the alternator during the starting period. Place the VOLTAGE BOOSTER switches in zero position (fig. 7). Remove any obstructions that will prevent free circulation of air (par. 9). Check the unit by visual inspection and see that the equipment is ready for operation.

b. During Operation. Be alert for unusual noise or vibration and remove the cause immediately. See that the load current is within the range of the alternator rating (par. 7b). Do not operate the VOLTAGE BOOSTER switches when the alternator is carrying an external load. Stop the equipment before making other adjustments.

c. After Operation. Disconnect the load at the output terminals and place the VOLTAGE BOOSTER switches in zero position. Wipe the equipment clean if required. See that wiring and electrical connections are secure and that accessories and the Instruction Book are stowed properly. Check the motor generator by visual inspection to see that the equipment is in proper order.

41. Weekly Maintenance Service

For the purpose of these instructions, a weekly service period is considered to be 64 operating hours. Perform daily maintenance services in accordance with DD Form 110 (par. 40). Perform weekly services in accordance with DA AGO Form 464 (par. 44).

42. Monthly Maintenance Service

For the purpose of these instructions, a monthly service period is considered to be 256 operating hours. Perform daily maintenance services in accordance with DD Form 110 (par. 40); perform weekly maintenance services in accordance with DA AGO Form 464 (par. 41); and check all items indicating required monthly service in accordance with DA AGO Form 464 (par. 44).

43. Annual Maintenance Service

For the purpose of these instructions, an annual service period is considered to be 2,048 operating hours. Perform daily, weekly, and monthly services as specified in paragraphs 40, 41, and 42. Send the motor generator to the field maintenance shop for technical inspection and general overhaul annually or after 2,048 operating hours. Instructions for general repair services are given in chapter 4. Lubricate the motor generator during disassembly according to instructions described in paragraph 34.

44. DA AGO Form 464 Service

DA AGO Form 464 (Work Sheet for Preventive Maintenance and Technical Inspection of Engineer Equipment) is provided as a guide in the performance of necessary periodic services and inspections. Make appropriate entries on this form whenever any of the operations listed are performed. The following are detailed instructions for items on DA AGO Form 464 which apply to Motor Generator PU-175/U.

TI	M	W	
	S	S	1. Before-operation Service. Perform all before-operation services in accordance with paragraph 40a.
L			2. Lubrication. Lubricate the equipment annually or at the time of technical inspection in accordance with instructions given in paragraph 34. Partial disassembly is required to facilitate lubrication.
C	C	C	3. Tools and Equipment. Inspect all tools and equipment. Thoroughly clean both the tools and the toolbox. See that all tools are in good condition and stowed properly. Wipe all tools with a cloth that has been moistened with Oil, lubricating, preservative, special, and lubricate all adjustable tools, such as wrenches and pliers. Inspect all accessories and equipment supplied with Motor Generator PU-175/U and thoroughly clean the unit. See that all equipment is in good condition and stowed properly.
X			4. Fire Extinguisher. Inspect all fire extinguishing equipment to see that it is in satisfactory condition and that extinguishers are fully charged.
S	S	S	5. Publications. See that the instruction book, technical manuals, technical bulletins, and other pertinent publications are available and in legible condition.
S	S		6. Appearance. Check the equipment for any damage to painted surfaces, traces of rust, or corrosion, and clean or refinish as needed (par. 38).
S	S		7. Modifications. Determine if any modification work orders have been issued for the equipment. Make sure that all modification work orders have been completed.
S	S		50. Coil, Wiring, Switches. Inspect the electrical wiring of the motor generator (par. 14 and figs. 2, 8, and 11) and see that it is in good condition and clean. Be sure that electrical connections are clean and secure. Repair or replace defective wiring. Operate the motor starter and VOLTAGE BOOSTER switches and see that the equipment responds correctly. Refer to the wiring diagram (fig. 6).

TI	M	W	
S	S	S	53. Voltage Booster. (Enter this item on DA AGO Form 464.) Remove the cover and examine the voltage booster (fig. 8). See that the unit is clean and that the electrical wiring is in good condition. Operate the motor generator with the switches in zero, boost, and buck position, respectively, first with an external load and then without load. (Remove the load or stop the unit each time before operating the switches.) Check the response of the output voltage to the voltage booster.
S	S		54. Motor Starter. (Enter this item on DA AGO Form 464.) Remove the cover and examine the motor starter (fig. 2). See that the unit is clean and that the electrical wiring is in good condition. Check the response of the START and STOP RESET buttons (par. 17). Examine the thermal units for general condition, and if the thermal units will not reset, replace them with new units.
S	S		80. Frame. Check the condition of the welded tubular frame of the unit (fig. 11). Examine the frame for distortion or breaks at welded joints. Correct any irregularities which are discovered.
S	S		84. Mounting. (Enter this item on DA AGO Form 464.) Check and tighten the four mounting bolts which attach the motor generator to the tubular frame (fig. 11).
S	S	S	133. Noise and Vibration. (Enter this item on DA AGO Form 464.) Examine the motor generator for excessive noise or vibration. Be sure that the unit is placed on a firm, level foundation before making this test (par. 10).
S	S		134. Drive Motor. (Enter this item on DA AGO Form 464.) Check the drive motor (fig. 7) to see that the rotor turns freely (par. 19a). Clean the motor thoroughly and remove any obstructions which would prevent the free circulation of air (par. 9). Check for excessive noise or vibration. Be sure electrical connections to the motor starter are correct and secure (par. 14b).
S	S	S	135. Temperature. (Enter this item on DA AGO Form 464.) Check the alternator and the drive motor (fig. 7) for excessive heating when the motor generator is operating at full-load. The temperature of the drive motor or alternator housing should not be too hot to touch with the bare hand. See that the load current on the alternator is within the range of the nameplate rating. Excessive electrical load or abnormal mechanical friction will cause the thermal units to stop the drive motor (par. 17).
S	S		172 Armature. The armature (rotor) (fig. 11) is a permanent-magnet type, and no commutator or brushes are used. Clean the alternator; blow out dust and dirt with light air pressure. Remove any metal chips which may adhere to the magnetized rotor.

44. DA AGO Form 464 Service (contd)

TI	M	W	
S	S		174. Drive Coupling. The alternator rotor is attached to the drive motor shaft extension (fig. 11) by a rigid drive coupling. See that the rotor turns freely within the alternator and that the drive coupling is tightened securely on the motor shaft.
S			175. Final Test. (Enter this item on DA AGO Form 464.) After the motor generator has been checked completely, apply a load to the output terminals (fig. 7) and see that the unit functions properly as indicated by voltage, frequency, and amperage. Operate the unit a minimum of 1 hour under load and observe the maximum temperature of the motor and alternator. The drive motor or alternator housing should not be too hot to touch with the bare hand.

Section IV. THEORY

45. General

Motor Generator PU-175/U (fig. 1) consists of a conventional electric motor, alternator, and voltage booster which are mounted on a tubular steel skid frame. The equipment provides a source of 400-cycle, single-phase, 120 volt electrical power.

46. Drive Motor

The drive motor (fig. 7) used with Motor Generator PU-175/U is a squirrel cage type, two-pole unit. The motor rating is 5 horsepower and requires a power source of 60-cycle, three-phase, 220- or 440-volt current. The synchronous speed is 3,600 rpm, but at full-load the slip is approximately 5 percent. This provides the necessary speed of 3,428 rpm to produce an alternator output frequency of 400 cycles. The stator has a three-phase, evenly distributed winding and the combination of 60-cycle current with two-pole distribution creates a rotating magnetic field at a synchronous speed of 3,600 rpm. The magnetic field of the stator induces voltage in the rotor which creates a rotating magnetic field which locks in step with the rotating field of the stator to produce rotor power at a synchronous speed of 3,600 rpm. The stator winding is star or wye connected with terminal leads provided to the ends and center of each phase. Thus the winding has nine terminal leads for connection either in series or parallel. When connected in parallel (LOW VOLT STAR) as shown on the nameplate (fig. 8) the motor will operate at 220 volts with a full-load of 14.0 amperes. When connected in series (HIGH VOLT STAR), as shown on the nameplate, the motor will operate at 440 volts, with a full-load of 7.0 amperes.

47. Alternator

Motor Generator PU-175/U includes an alternator (fig. 7) designed to produce 400-cycle, 120-volt current with rated power of 2.5 kw. An a-c cycle is defined as starting at zero, increasing to maximum value with positive charge, decreasing to zero, increasing to maximum value with negative charge, and again decreasing to zero. This cycle is repeated 400 times per second to produce the 400-cycle frequency. The alternator is a permanent-magnet type with the rotor providing a rotating field and, thus, no commutator or brushes are required. The rotor consists of 14 permanent-magnet poles (aluminum, nickel, and cobalt alloy) equally spaced around a steel magnetic ring. The poles are held in position by steel pole shoes which are fastened with stainless steel screws. The entire assembly is molded in aluminum to provide mechanical strength and a path for magnetic flux. The rotor is charged electrically with the poles having alternate polarity, north and south around the circumference. The molded aluminum body of the rotor also prevents loss of magnetism in the event of an accidental short circuit in the alternator. The diagram (fig. 9) indicates magnetic flux leaving each north pole of the rotating field, passing

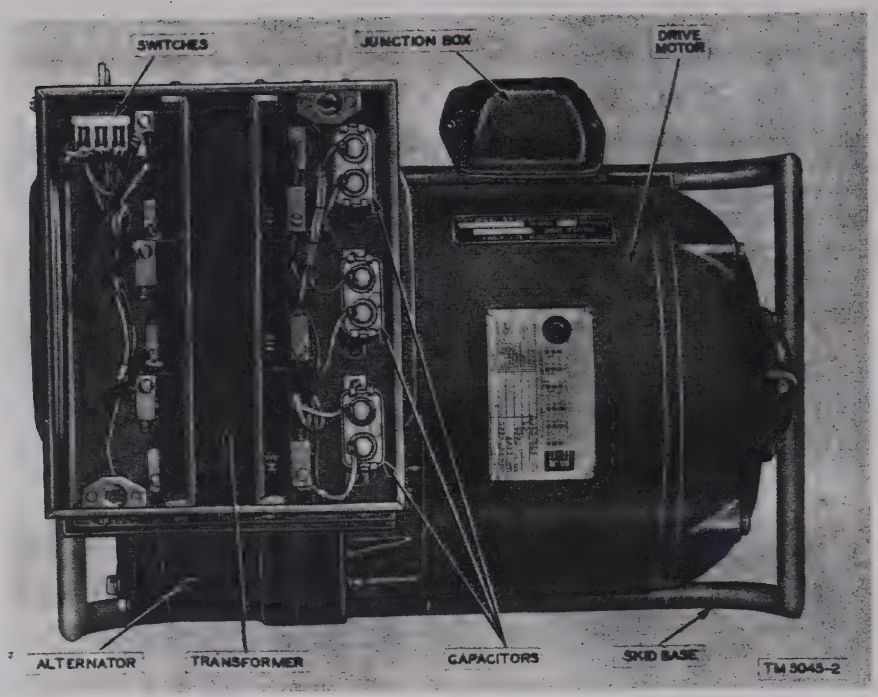

Figure 8. Motor Generator PU-175/U, top view, voltage booster cover removed.

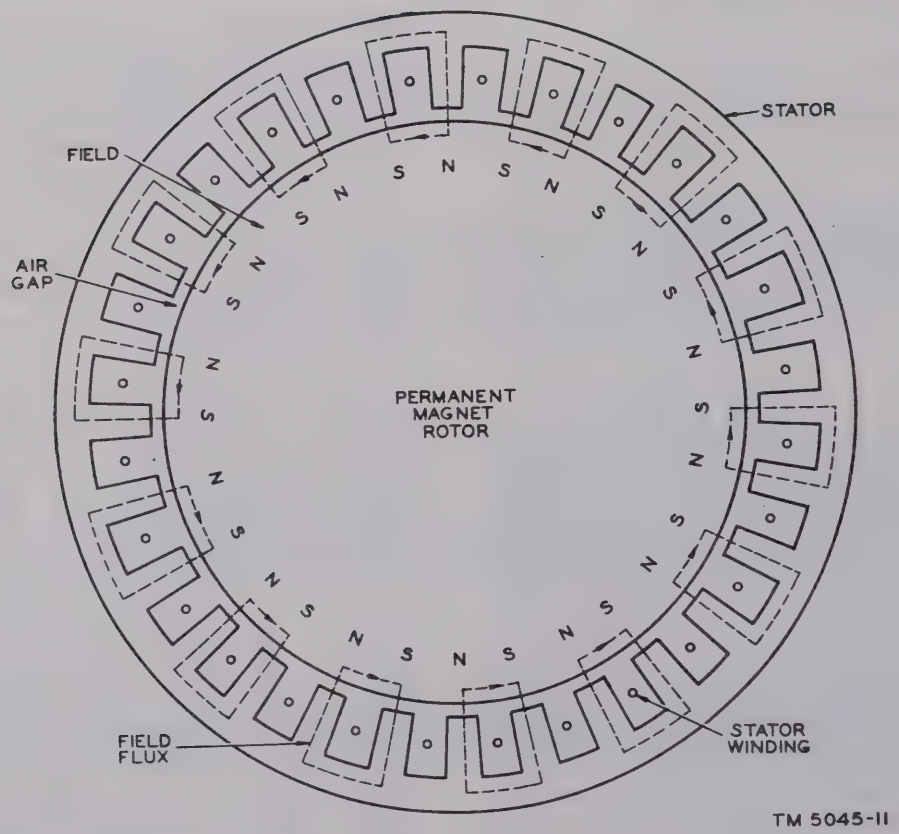

Figure 9. Motor Generator PU-175/U, alternator theory.

through the iron core of the stator, and then returning to the south pole of the rotating field. When the rotor is turned by the drive motor, the magnetic flux lines of force sweep past the copper wire winding and generate a voltage in the stator. The voltage value depends on the strength of the magnet, the number of turns of wire, and the speed of rotation. The direction of current in each wire changes with the passing of each alternate north and south pole. The combination of 14 poles and speed of 3,428 rpm produces a 400-cycle current.

48. Voltage Booster

Motor Generator PU-175/U is equipped with a voltage booster (fig. 7) to provide partial control of the output voltage. The unit consists of a compensating type transformer, capacitors, and switches (fig. 10). The primary windings of the transformer are connected in series with the alternator windings, and the capacitors are connected across the secondary windings. An increase or decrease in the output voltage is accomplished by switching the secondary circuit to add voltage to or to subtract voltage from the transformer primary circuit. When the switches are placed in zero position, the capacitors are placed directly across the secondary only, and no connection is made between the secondary and the primary circuit. Therefore, no voltage change is effected in the primary circuit. The approximate voltage increase or decrease from zero position is 9 volts; this provides a range of 18 volts for adjustment of the alternator output voltage.

Caution: Do not operate the VOLTAGE BOOSTER switches with an external load connected. Remove the load or stop the unit.

Section V. TROUBLE SHOOTING

49. Meaning of Trouble Shooting

Trouble shooting involves the detection and location of the cause of faulty operation of equipment and the correction of the fault before it develops into a break-down which will necessitate major repairs. Trouble shooting consists of sectionalization and then localization of the cause of faulty operation or failure. In sectionalization, the cause is traced through a series of checks to determine the component of the equipment or system in which the cause of trouble is located. The cause then is localized by a further series of checks to determine the specific part that is responsible for the difficulty or failure. All operational difficulties have certain rather definite symptoms which will serve as clues to the cause of trouble. Operators should learn to identify these clues since they will save valuable time in localizing troubles. Having identified the clue, reference then should be made to the trouble-shooting chart (par. 50).

50. Trouble-shooting Chart

Symptom	Possible cause	Remedy
Motor fails to start.	No supply line voltage.	Check supply line voltage.
	One phase open circuit.	Check phase continuity.
	Motor lead terminals connected wrong.	Check motor lead terminal connections with nameplate (par. 14b).

50. Trouble-shooting Chart (contd)

Symptom	Possible cause	Remedy
Motor stops after running a short time.	Motor starter thermal units have opened the circuit.	Push STOP RESET button, then START button (par. 17).
	Failure of power source.	Check supply line voltage.
	Wrong thermal units in motor starter.	Change thermal units for proper voltage source (par. 17).
Motor does not reach full speed.	Motor generator is tight.	Check shaft of unit; see that it rotates freely.
	Excessive alternator load.	Check the alternator load according to nameplate rating.
Motor runs too slowly under load.	Supply line voltage or frequency too low.	Check supply line voltage and frequency.
	Excessive alternator load.	Adjust alternator load within range of nameplate rating.
Motor runs too fast under load.	Supply line voltage or frequency too high.	Check supply line voltage and frequency.
No output voltage.	Open in output voltage circuit.	Check wiring and connections and correct defects (par. 14).
	Open circuit in alternator winding.	Check alternator windings for continuity of each phase.
Low output voltage.	Slow speed.	Check supply line voltage and frequency.
	Open or short circuit in voltage booster.	Check wiring and connections. Check transformer windings and capacitors.
	Short circuit in load.	Check connections to output terminals.
High output voltage.	Motor speed too fast.	Check supply line voltage and frequency.
Excessive heating of unit.	Alternator overload.	Reduce load to range of nameplate rating.
	Improper ventilation.	Check ventilation openings; clear any obstructions (par. 9).
Noisy motor generator.	Defective ball bearings.	Check ball bearings and replace if required.
	Loose mounting.	Check mounting and tighten bolts.

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. PREREPAIR PROCEDURES

51. Scope

This chapter is written for personnel in charge of field and depot maintenance. The instructions cover complete repair and overhaul of Motor Generator PU-175/U. Information covers procedure for disassembly, reassembly, adjustments, and final testing prior to return of the unit to service. The extent of repair is limited only by the tools and test equipment available and by the skill of the assigned personnel.

52. Preliminary Inspection

Before starting repair work, check the Motor Generator for specific troubles noted by the operating personnel. If the unit can be operated, start the drive motor and check appropriate items in accordance with paragraph 44 for DA AGO Form 464. The technical inspection is completed only when this examination is finished and DA AGO Form 464 is filled out properly.

Section II. POWER REQUIREMENTS

53. Requirements for Operation of Motor Generator PU-175/U

The electric current source required for operation of the drive motor of Motor Generator PU-175/U must be three phase, 60 cycles, 220 or 440 volts of sufficient capacity to start and operate the 5-horsepower motor. Use #10 or larger wire to connect the drive motor to the power source.

54. Requirements for Testing Operation of Motor Generator PU-175/U

All meters used in testing the operation of the motor generator must be calibrated for 400-cycle operation. Meters calibrated for 60-cycle operation will not indicate accurately.

Section III. CLEANING, INSPECTING, AND STRIPPING

55. Cleaning

Remove all grease, oil, dust, and dirt from the exterior of the motor generator (fig. 1). Use solvent (SD) for cleaning, if necessary. Use light air pressure to blow out dust and dirt from the interior air passages. After disassembly, clean the interior of the unit with solvent (SD) as required. Dampen a cloth with solvent (SD) and wipe the wires clean. Do not use excessive solvent (SD) on wiring and electrical connections.

56. Stripping

a. Voltage Booster. Remove the voltage booster (figs. 7 and 10) as follows:

(1) Turn the locking screws which attach the cover and remove the cover.

(2) Remove the screws which attach the box to the base and to the transformer.

(3) Remove the locknuts which hold the switches to the box.

(4) Lift the box from the unit.

(5) Disconnect all wires at transformer terminals and to the output terminal board and tag each wire as it is disconnected (fig. 8).

(6) Remove the screws which hold the transformer to the base and lift the transformer free.

(7) Remove the screws which attach the capacitors to the base and remove the capacitors.

(8) Remove the screws and detach the voltage booster base from the alternator stator housing.

b. Output Terminal Board. After disconnecting the leads, remove the output terminal block (fig. 11) from the terminal bracket. Remove the bracket from the alternator stator housing.

c. Frame. Remove the four bolts which attach the drive motor to the tubular skid frame (fig. 11) and lift the motor generator from the frame.

57. Detailed Inspection

a. Voltage Booster. Examine the wires and electrical connections for damage and replace defective wiring. Visually check the transformer (fig. 10) for evidence of damage or excessive heating. If possible, make a resistance comparison test of the three phases for both primary and secondary windings. Check the capacitors (fig. 10) for indication of open or short circuit and replace them if necessary. Examine the switches and see that the mechanical operation is satisfactory. Clean any dirty parts in accordance with paragraph 55.

b. Output Terminal Board. Check the terminal board (fig. 11) and, if damaged, replace it.

c. Frame. Check the tubular skid frame (fig. 11) for distortion or cracked welds at joints. Repair the skid frame as required.

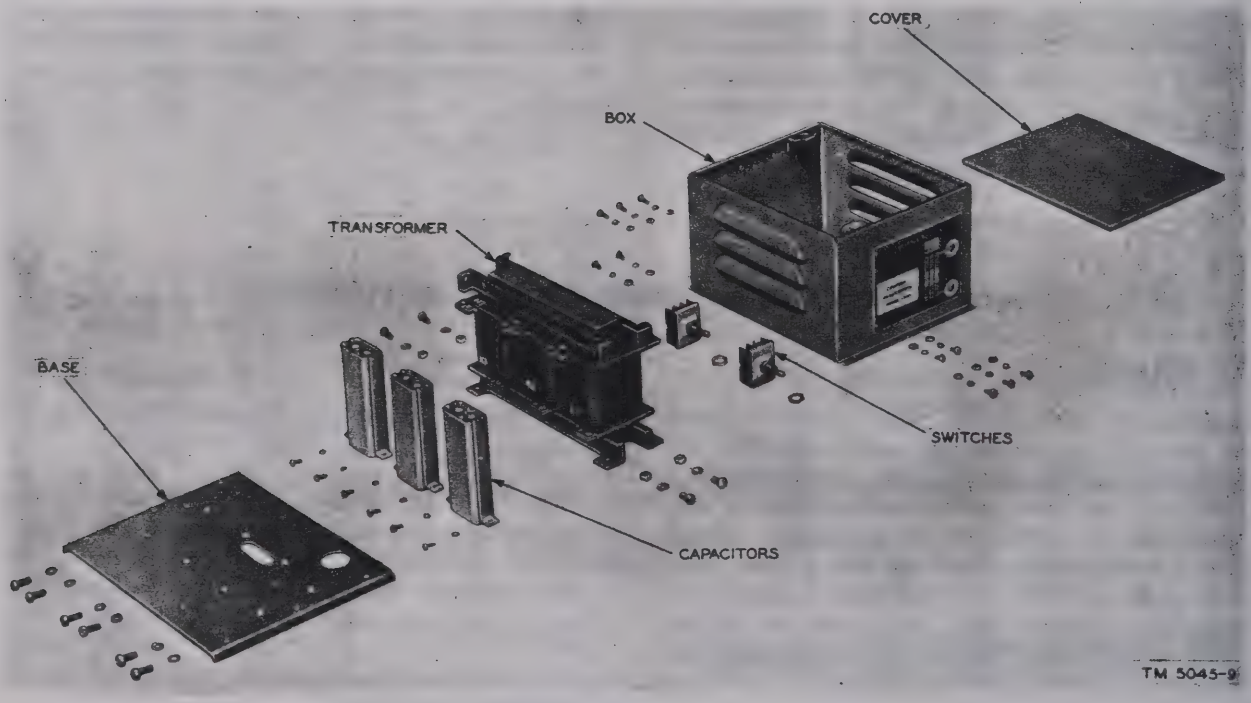

Figure 10. Voltage booster, Motor Generator PU-175/U, exploded view.

Section IV. DISASSEMBLY

Note. The following instructions are applicable after the equipment has been stripped in accordance with instructions in paragraph 56.

58. Alternator (fig. 11)

a. Loosen the bolts and remove the end bell at the rear of the alternator.

b. Remove the louver cover and venturi from the end bell.

c. Loosen the bolts and remove the stator assembly from the adapter casting. Magnetic attraction of the rotor will tend to prevent removal.

d. Remove the bolts which hold the ventilating fan to the rotor.

e. Loosen the set screws in the rotor hub and pull the alternator rotor from the drive motor shaft extension.

f. Remove the rotor hub from the alternator rotor. Keep the rotor clean because metallic chips are attracted by the magnetization. Protect the winding of the stator assembly from damage.

Note. The inner ball bearing of the shaft extension end of the drive motor may be lubricated if necessary (par. 34) without further disassembly. If the inner ball bearing is defective, see paragraph 59f for a description of further disassembly.

59. Drive Motor (fig. 11)

a. Loosen and remove the two screws in the bearing housing of the adapter casting.

b. Loosen and remove the four bolts that attach the adapter casting to the drive motor. Remove the adapter casting from the drive motor.

c. Remove the four screws that attach the venturi to the adapter casting. Remove the venturi.

d. Remove the two screws from the bearing housing of the end bell at the front of the drive motor. Pull the drive motor rotor assembly from the stator assembly.

e. Remove the four bolts which attach the end bell to the motor stator housing. Remove the end bell from the housing.

f. If either or both of the bearings are to be replaced, use a conventional bearing puller to remove the defective bearings from the drive motor shaft.

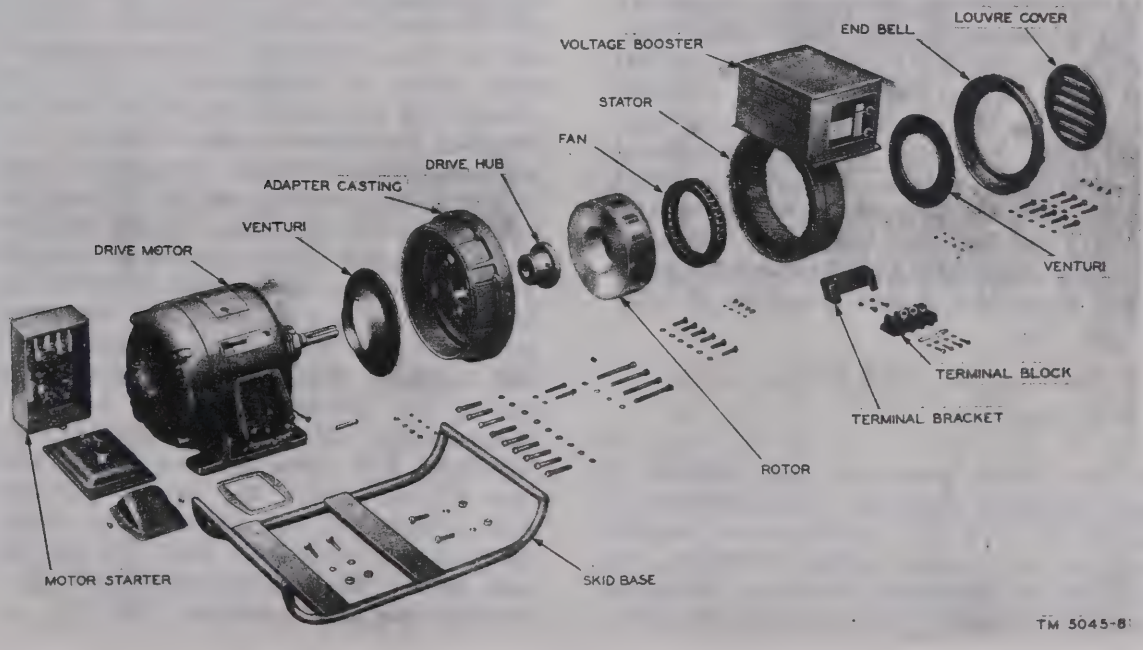

Figure 11. Motor Generator PU-175/U, exploded view.

Section V. REASSEMBLY

60. Drive Motor

Before the drive motor is reassembled be sure to examine the ball bearings for evidence of dirt or excessive looseness. When replacing bearings, be sure to press against the inner race (ring) and not against the outer race (ring) of the bearing. Clean all parts in accordance with paragraph 55. Check the stator winding for evidence of damage and, if possible, make comparison resistance tests of the three phase windings. Examine the motor lead wires and terminal connections, and replace them if necessary. Be sure that the motor shaft is free of rust, nicks, and burrs. Then reassemble the drive motor by reversing the operations described in paragraph 59. Be sure that the motor shaft turns freely after reassembly is completed.

61. Alternator (fig. 11)

Clean all alternator parts in accordance with the procedure given in paragraph 55. Give particular attention to the magnetized rotor and remove any metal particles which may adhere to it. Check the alternator winding for evidence of damage and, if possible, make comparison resistance tests of the three-phase windings. Examine the alternator lead wires and terminal connections, and, if necessary, replace them. Reassemble the alternator by reversing the procedures described in paragraph 58. After reassembly of the alternator, be sure the shaft of the unit turns freely.

62. Subassemblies

To attach and reassemble the remaining parts, components and subassemblies, reverse the procedures described in paragraph 56.

Section VI. FINAL TESTING

63. General

Follow the instructions given in pars. 19 through 24 for operation under usual conditions. Connect the motor starter (fig. 2) to the drive motor (fig. 7) and to a power source having the proper voltage and frequency (par. 14). See that all electrical connections are secure. Provide a switch in the circuit between the alternator output terminals and the load (par. 22). Place the VOLTAGE BOOSTER switches in zero position and check the proper direction of rotation (par. 14c).

64. Final Inspection

Start the motor generator and operate it without external load for approximately 15 minutes or until the alternator is warm. Check for any unusual noise, vibration, or unsatisfactory operating condition. With the VOLTAGE BOOSTER switches in the zero (neutral) position (fig. 7), and without external load, the voltage from phase to phase will be approximately 131 volts. The speed of the unit should be approximately 3,575 rpm which is equivalent to 417 cycles. Change the switches to boost (+9v) and in this position the phase-to-phase voltage will be approximately 141 volts. Change the switches to buck (-9v) position, and the voltage will be approximately 122 volts. Follow this test by adding a single-phase resistance load of 21.0 amperes to any two output terminals of the alternator, and the speed will be approximately 3,428 rpm which is equivalent to 400 cycles. The phase-to-phase voltage across the loaded terminals will be approximately 122 volts for the zero switch position, 113 volts for the buck position, and 131 volts for the boost position. If test results are not satisfactory, check all electrical connections (par. 14 and fig. 6) and follow the recommendations in the trouble-shooting chart (par. 50).

Note. No meters are furnished with Motor Generator PU-175/U. Instruments should be available to check the unit performance. To check the alternator use a voltmeter with a range of 0 through 150 volts, an ammeter with a range of 0 through 50 amperes, and a frequency meter with a range of 380 through 420 cycles. The meters must be calibrated for 400-cycle operation because 60-cycle meters will not indicate accurately. By removing the louver cover a tachometer can be used (applied against the end of the shaft) to check the speed of the unit, and the value then can be converted to frequency in cycles by means of the formula, Frequency $= \frac{\text{rpm} \times 7.}{60}$

Section VII. REFINISHING

65. Weatherproofing after Repair

a. Clean oil and grease from the exterior of the Motor Generator PU-175/U. Use a clean cloth. Dampen the cloth with solvent (SD), if necessary. Be sure that all necessary repairs and adjustments have been completed.

b. Mask all electrical contacts and connections. Moistureproof and fungiproof the equipment in accordance with TB SIG 13.

66. Refinishing

a. Inspect the painted surfaces of the equipment for scratches or other damage.

b. Remove all oil, grease, and rust. Use solvent (SD) for removing oil, grease, and dirt. Use fine sandpaper on surfaces to be refinished. Apply light, even coats of paint with a small brush. Two light coats of paint are better than one heavy coat.

c. If extensive areas of the equipment require refinishing, remove all old paint with paint remover. Sandpaper the surfaces or clean them with steel wool. Apply a smooth even priming coat, allow to dry, sand lightly with #000 sandpaper, and then apply the finish coat of paint.

Caution: Avoid painting moving parts or controls that would hinder operation. Do not paint electrical contacts. Keep paint and paint remover, if used, out of oilholes and air passages.

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, SIG 7&8, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7&8-PU-175/U. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

Identification Table of Parts

Fig. Ref.	Name of part and description	Function of part	Signal Corps stock No.
1	MOTOR GENERATOR: a-c; 220/440 v, 14/7 amp, 60 cyc, 3 phase, 3-wire input; 120 v, 26 amp, 400 cyc, 3 phase, 2,500 w, 3-wire output; +50° C ambient temp w/40° C rise at continuous duty; 3,440 rpm at full-load; dripproof; 10,000' max altitude rating; 21" lg x 15" wd x 19" h.	Converts 60-cycle ac to 400-cycle ac.	3H3370-175
	MOTOR GENERATOR, bare unit: Motor Generator PU-175/U, bare unit only.		3H3370-175Z
	MOTOR GROUP		
	BEARING, ball: single row radial; std fit; 8 balls; 1.1811" bore, 2.8346" OD x .7480" wd.	Provides low friction support for motor shaft.	3H320-51
11	KEY, machine: carbon steel; square; .250" wd x .301" thk x 2" lg.	Provides mechanical rigidity of hub on drive motor shaft.	6L996-32-2
	STATOR, motor: 220/440 v, 60 cyc, 14/7 amp, 3 phase; approx 9-1/2" lg x 12" wd x 11" h o/a; Elliott Co Crocker-Wheeler Div part #1210515.		3H5340A-15
	GENERATOR GROUP		
11	STATOR, generator: aluminum and steel; 120-v, 400-cyc, 3-phase, 3.1-kva ac at .8 pf; nine tapped mtg holes; 12-1/8" OD x 3.468" wd.	Stationary winding of generator.	3H5259-8
	GENERATOR CONTROL GROUP (VOLTAGE BOOSTER)		
7, 10	CONTROL, generator: aluminum case; two 3-pole DT switches; 120-v, 400-cyc, 3-phase ac; 11" lg x 8-7/8" wd x 6-1/2" h.	Provide automatic partial compensation for voltage drop and also a means of manually boosting or bucking the voltage.	3H1096-1

Identification Table of Parts (Cont'd)

Fig. Ref.	Name of part and description	Function of part	Signal Corps stock No.
10	CAPACITOR, fixed: paper dielectric; one sec.; 2 uf +20%, -10%; 1000-v dc; 4-3/4" lg x 1-13/32" wd x 1-1/16" d; two terminals.	Stabilizer for voltage booster.	3DB2-255
10	SWITCH, toggle; phenolic body; 15 amp; 125-v ac; 3-pole DT; 1-13/16" lg x 1-3/8" wd x 3/4" h.	Circuit shifter in voltage booster.	3Z9849.246
10	TRANSFORMER, power regulating: 110- to 130-v, 400-cyc, 3-phase, 3.1-kva input; 120-v (±7 v), 26-amp output; three input terminations; three output terminations; four mtg holes; u/w three fixed capacitors; 9-1/2" lg x 2-7/8" wd x 4-1/2" h.	Provides for voltage regulation.	2Z9614-237
	MOTOR STARTER GROUP		
	GROMMET: rubber; fits 1-1/16" dia hole; Atlan India Rub part #2867.	Provides insulation for wires passing through motor starter box knockouts.	6Z4892-12
2	STARTER, motor: across the line; 220/440-v, 60-cyc, 3-phase ac; 5 hp; semiautomatic; one speed; continuous duty; dripproof; two mtg holes; 8-1/4" lg x 5-1/4" wd x 4-1/2" h.	Provides for starting and stopping the equipment manually, for automatic stopping of equipment under overload, and for resetting after automatic stopping.	3H5310-38
4	THERMAL RELEASE, circuit breaker: 6.40 amp; brass case; flat; marked #B7.7; 1-7/8" lg x 1" wd x 1/2" thk.	To break circuit in case of overload.	3H5565-8
2, 4	THERMAL RELEASE, circuit breaker: 14.5 amp; brass case; flat; marked B15.5; 1-7/8" lg x 1" wd x 1/2" thk.	To break circuit in case of overload.	3H5565-7
	MISCELLANEOUS GROUP		
	LABEL, circuit: plastic; 4" lg x 3" wd x 1/32" thk.	Circuit label.	6D16818-44
7	TERMINAL BOARD: phenolic; three double-screw type terminals; four mtg holes; barrier type; 5-1/8" lg x 2-1/2" wd x 1-1/8" h.	Provides for connecting external load to alternator output.	2Z9406.199

APPENDIX III

TABLE OF STANDARD NUTS, BOLTS, SCREWS, AND WASHERS

Quantity	Item	Size	Length (in.)	Thread	Where Used
12	Screw: Bind H	#10	1/4	NF 32	Transformer terminals.
1	Screw: set	5/16"	1/2	NF 24	Rotor hub.
6	Screw: hex. head	5/16"	1-1/4	NF 24	Attaches hub to rotor.
6	Washer: lock	5/16"			Used with above.
4	Screw: Fil H	#10	3/8	NC 24	Attaches fan to rotor.
4	Washer: lock	#10			Used with above.
4	Screw: socket head	5/16"	3-1/2	NC 18	Attaches adapter casting to drive motor.
9	Screw: socket head	5/16"	2	NC 18	Attaches stator assembly to adapter casting.
13	Washer: lock	5/16"			Used with above.
4	Screw: Fil H	#8	3/8	NC 32	Attaches venturi to adapter casting.
4	Screw: Fil H	#8	1/2	NC 32	Attaches venturi and louver cover to end bell.
4	Nut: hex.	#8		NC 32	Used with above.
8	Washer: lock	#8			Used with above.
9	Screw: hex. head	5/16"	1-3/4	NC 18	Attaches end bell to stator assembly.
4	Screw: hex. head	5/16"	1-1/4	NC 18	Attaches drive motor to skid base.
13	Washer: lock	5/16"			Used with above.
4	Nut: hex.	5/16"		NC 18	Used with above.
6	Screw: Fil H	1/4"	5/8	NC 20	Attaches voltage booster base to stator assembly.
2	Screw: Fil H	1/4"	3/8	NC 20	Attaches output terminal bracket to stator assembly.
8	Washer: lock	1/4"			Used with above.
4	Screw: RH	#10	7/8	NF 32	Attaches output terminal board to bracket.
4	Washer: plain	#10			Used with above.

Quantity	Item	Size	Length (in.)	Thread	Where Used
4	Screw: Fil H	1/4"	1-1/2	NC 20	Attaches drive motor bearing closures.
4	Washer: lock	1/4"			Used with above.
6	Screw: Fil H	#10	1/2	NC 24	Attaches voltage booster box to base.
4	Screw: RH	#10	3/8	NC 24	Attaches voltage booster box to transformer.
10	Nut: hex.	#10		NC 24	Used with above.
10	Washer: lock	#10			Used with above.
6	Screw: RH	#8	3/8	NC 32	Attaches capacitors to voltage booster base.
6	Screw: RH	#8	1/4	NC 32	Voltage booster box assembly.
12	Washer: lock	#8			Used with above.
4	Screw: Fil H	1/4"	1/2	NC 20	Attaches transformer to base.
4	Nut: hex.	1/4"		NC 20	Used with above.
4	Washer: lock	1/4"			Used with above.
4	Screw: RH	#4	1/4	NC 40	Attaches cover fastener to box.
4	Nut: hex.	#4		NC 40	Used with above.
4	Washer: lock	#4			Used with above.
4	Rivet: tubular	1/16"	1/8		Attaches wiring diagram to cover.
4	Screw: Fil H	#10	1-1/2	NC 24	Attaches brackets to transformer.
4	Nut: hex.	#10		NC 24	Used with above.
4	Washer: lock	#10			Used with above.

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